CLAIMS

What is claimed is:

1. A composition, comprising a plurality of nanorods that define a local volume, said local volume including a fraction, said plurality of nanorods within at least said fraction of said local volume interrelated to define (a) a substantially random distribution of spatial orientations of said plurality of nanorods and (b) a localized packing density greater than 50% of a theoretical maximum packing density, which does not account for any voids within said plurality of nanorods.

2. The composition of claim 1, wherein said plurality of nanorods include at least one element selected from the group consisting of carbon, silicon, silicon carbide, germanium, boron nitride and gallium arsenide.

3. The composition of claim 1, wherein said plurality of nanorods include at least one substantially cylindrical nanostructure selected from the group consisting of nanowires, multi-wall nanotubes and single-wall nanotubes.

4. A method of making the composition of claim 1, comprising the steps of:

providing a condensed phase matrix material; and

activating said condensed phase matrix material to produce said plurality of nanorods by condensed phase conversion growth.

5. A composite material, comprising the composition of claim 1.

6. The composition of claim 1, wherein said plurality of nanorods are at least partially interwoven within said fraction.

7. A method for fabricating a composite material which comprises utilizing the composition of claim 1.

8. The composition of claim 1, wherein said plurality of nanorods are prepared by condensed phase conversion growth.

9. A method, comprising:

providing a condensed phase matrix material; and

activating said condensed phase matrix material to produce a plurality of nanorods by condensed phase conversion growth.

10. The method of claim 9, wherein said condensed phase matrix material is provided by condensing a gaseous phase source of condensed phase matrix material.

11. The method of claim 9, wherein said condensed phase matrix material includes at least one member selected from the group consisting of carbon, silicon, silicon carbide, germanium, and gallium arsenide and said plurality of nanorods include at least one member selected from the group consisting of carbon, silicon, silicon carbide, germanium, boron nitride and gallium arsenide.

12. The method of claim 11, wherein said condensed phase matrix material includes amorphous carbon particles with an average diameter of from approximately 1 nm to approximately 100 nm.

13. The method of claim 9, further comprising providing a plurality of catalyst particles, wherein activating said condensed phase matrix material includes activating said plurality of catalyst particles to produce a plurality of nanorods by condensed phase conversion growth.

14. A composition made by the method of claim 9.

15. A vehicle, comprising the composition of claim 14.

16. An apparatus for performing the method of claim 9.

17. The method of claim 9, wherein said condensed phase matrix material is prepared by at least one technique selected from the group consisting of laser ablation, thermal spray, electric arc, plasma arc, infrared vaporization, microwave vaporization, mechanical grinding, mechanical fracture, explosive vaporization, ion sputtering, electron beam etching.

18. The method of claim 9, wherein said condensed phase matrix material includes a plurality of solid phase templates and activating said condensed phase matrix material includes activating said plurality of solid phase templates to grow said plurality of nanorods by condensed phase conversion growth from said solid phase templates.

19. The method of claim 18, wherein said plurality of solid phase templates include nanorods.

20. The method of claim 18, wherein said solid phase templates include single wall nanotubes.

21. The method of claim 20, wherein said single wall nanotubes are produced by condensed phase conversion growth and activating said plurality of solid phase templates includes reactivating said single wall nanotubes.

22. The method of claim 19, wherein said plurality of nanorods are produced by condensed phase conversion growth and activating said plurality of solid phase templates includes reactivating said plurality of nanorods.

23. The method of claim 9, wherein said condensed phase matrix material is provided in a pattern on a substrate.

24. The method of claim 23, further comprising providing at least one catalyst particle on said pattern, wherein activating said condensed phase matrix material includes activating said at least one catalyst particle to transform said condensed phase matrix material into at least one nanorod by condensed phase conversion growth.

25. The method of claim 9, wherein said condensed phase matrix material is provided in a mold space.

26. The method of claim 9, wherein said plurality of nanorods include at least one substantially cylindrical nanostructure selected from the group consisting of nanowires, multi-wall nanotubes and single-wall nanotubes.

27. The method of claim 9, further comprising acquiring data from said plurality of nanorods during activating.

28. The method of claim 25, further comprising changing operational parameters of activating using acquired data to optimize said plurality of nanorods.